UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
Address: COMMISSIONER FOR PATENTS
P.O. Box 1450
Alexandria, Virginia 22313-1450
www.uspto.gov

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/605,293	06/28/2000	DAVID L. CHAPEK	MIO-0037-VA	5927

7590 04/04/2006

KILLWORTH GOTTMAN HAGAN SCHAEFF L L P
ONE DAYTON CENTRE, SUITE 500
DAYTON, OH 45402-2023

EXAMINER	
RICHARDS, N DREW	

ART UNIT	PAPER NUMBER
2815	

DATE MAILED: 04/04/2006

Please find below and/or attached an Office communication concerning this application or proceeding.

UNITED STATES PATENT AND TRADEMARK OFFICE

Commissioner for Patents
United States Patent and Trademark Office
P.O. Box 1450
Alexandria, VA 22313-1450
www.uspto.gov

BEFORE THE BOARD OF PATENT APPEALS AND INTERFERENCES

Application Number: 09/605,293
Filing Date: June 28, 2000
Appellant(s): Chapek, David L.

Susan M. Luna
For Appellant

EXAMINER'S ANSWER

This is in response to the appeal brief filed 12/19/05 appealing from the Office action mailed 10/04/05.

(1) Real Party in Interest

A statement identifying by name the real party in interest is contained in the brief.

(2) Related Appeals and Interferences

The examiner is not aware of any related appeals, interferences, or judicial proceedings which will directly affect or be directly affected by or have a bearing on the Board's decision in the pending appeal.

(3) Status of Claims

The statement of the status of claims contained in the brief is incorrect. A correct statement of the status of the claims is as follows:

This appeal involves claims 9-12 and 14.

Claims 9-12 and 14 are rejected.

Claims 1-8 and 13 are cancelled.

(4) Status of Amendments After Final

The appellant's statement of the status of amendments after final rejection contained in the brief is correct.

(5) Summary of Claimed Subject Matter

The summary of claimed subject matter contained in the brief is substantially correct. The following discussion supplement's Appellant's summary so as to assist the Board in better understanding the invention and the issues on appeal.

Appellant refers to pages 7-10 of their specification as the supporting description for claim 9. Claim 9 recites "free of sputtered metal contaminants" but page 7-10 of the specification merely recites that appellant's process "reduces the possibility of contamination." Thus, appellant's specification merely describes reducing the possibility of contamination and not a device that is "free" of sputtered metal contaminants. Nowhere in appellant's disclosure or arguments on appeal has appellant pointed to any clear definition or clarifying disclosure as to their structure being completely free of any sputtered metal contaminants or any other metal contaminants.

Appellant also refers to pages 10-14 as the supporting description of claims 10-12 and 14, however pages 10-14 do not discuss metal contamination, sputtered or otherwise, and therefore provide no additional support or clarification for the "free of sputtered metal contaminants" limitation recited in the claims.

It is important in this appeal to note that all the appealed claims are directed towards a product, or structure, and are not directed towards the method of forming or manufacturing that structure. Thus the limitations written as to have some method associated therewith should be interpreted in light of the structure formed by that method and not limited to the method itself. That is to say, these limitations should be interpreted under the well established product-by-process doctrine. Thus, the claims do

not require plasma source ion implantation be used as the process for doping the layer of silicon dioxide with hydrogen ions. Further, the limitation of the layer of silicon dioxide being "free of sputtered metal contaminants" should not be read as requiring a lack of metal contaminants formed by the specific method of sputtering. It is noted that the structure of a metal contaminant is the same regardless of whether the metal contaminant was introduced by sputtering, diffusion, or any other method or if the metal contaminant was the result of contamination of the original starting substrate.

(6) Grounds of Rejection to be Reviewed on Appeal

The appellant's statement of the grounds of rejection to be reviewed on appeal is correct.

(7) Claims Appendix

The copy of the appealed claims contained in the Appendix to the brief is correct.

(8) Evidence Relied Upon

Applicant's admitted prior art, pages 1-2 of their specification under the heading "BACKGROUND OF THE INVENTION"

5,576,229 MURATA ET AL. 11-1996

Burns et al., Principles of Electronic Circuits, pp. 380-381

(9) Grounds of Rejection

The following ground(s) of rejection are applicable to the appealed claims:

Claim Rejections - 35 USC § 112

The following is a quotation of the second paragraph of 35 U.S.C. 112:

> The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

Claims 9-12 and 14 rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

Claims 9-12 and 14 include the limitation of the layer of silicon dioxide being free of sputtered metal contaminants. This limitation is indefinite. It is indefinite as to what is required by the limitation "free" of sputtered metal contaminants. Free is a relative term that renders the claims indefinite. Free is a relative term because accepted physics principles dictate that no material will be completely free of metal contaminants, therefore "free" is in fact a relative term. The relative term "free" is indefinite since, in the context of the claims, one of ordinary skill in the art would not know what level of contaminants is required to meet the limitation. The claim does not define any standard for determining the level of contaminants that may be present. Further, the specification does not provide any objective standard for the relative term such that one of ordinary skill in the art would not know what level of contaminants is needed to be considered "free."

As best understood, the claims are rejected over prior art as follows.

Claim Rejections - 35 USC § 102

The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

> A person shall be entitled to a patent unless –
>
> (a) the invention was known or used by others in this country, or patented or described in a printed publication in this or a foreign country, before the invention thereof by the applicant for a patent.

Claim 9 is rejected under 35 U.S.C. 102(a) as anticipated by Applicant's admitted prior art.

Applicant's admitted prior art discloses on page 1 lines 12-16 a semiconductor substrate, a layer of silicon dioxide on the substrate, and a layer of polycrystalline silicon formed on the silicon dioxide, the polycrystalline silicon having a smooth morphology. The admitted prior art discloses the layer of silicon dioxide having been doped with hydrogen ions. Applicants admitted prior art is considered to inherently teach a substrate as the admitted prior art teach DRAM's and DRAM's inherently have a substrate. Though the admitted prior art does not explicitly state a layer of polysilicon is on the silicon dioxide it is implicitly understood that the polysilicon is formed seeing that the admitted prior art discusses performing the hydrogen doping of the silicon dioxide so as to provide a thinner, smoother polysilicon film deposited on the silicon dioxide. The admitted prior art does not explicitly state the layer of silicon dioxide being "free of sputtered metal contaminants" but this limitation is considered implicitly understood. In light of the indefiniteness of the relative term "free," the limitation "free of sputtered

metal contaminants" is interpreted as meaning sufficiently free so as to operate. Applicant acknowledges in their admitted prior art that even though the device produced using the Kaufman ion source causes some amount of contamination, industry is currently using this method and thus the silicon dioxide layer is "free" of sputtered metal contaminants. Restated, the claim as written is so broad as to read on a conventional layer.

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

Claims 10-12 are rejected under 35 U.S.C. 103(a) as being unpatentable over Burns et al. (Principles of Electronic Circuits, Pp. 380 and 381) in view of Applicant's admitted prior art.

Burns et al. teach a field effect transistor in figure 9.8 on page 381. Burns et al. teach a substrate, silicon dioxide layer, a layer of polycrystalline silicon over the silicon dioxide layer, and a gate oxide, a source and a drain in the substrate where a gate electrode is formed from the layer of polycrystalline silicon. Burns et al. do not teach the layer of silicon dioxide having hydrogen ions implanted therein or being free of sputtered metal contaminants. Applicant's admitted prior art teaches implanting hydrogen ions

into silicon dioxide on page 1 lines 12-16. Applicant's admitted prior art as discussed above also teaches the silicon dioxide as being "free of sputtered metal contaminants." In the combination of the references, the gate oxide would be formed from the layer of silicon dioxide having hydrogen ions implanted therein.

Burns et al. and Applicant's admitted prior art are combinable because they are from the same field of endeavor. At the time of the invention it would have been obvious to a person of ordinary skill in the art to implant hydrogen ions into the silicon dioxide layer. The motivation for doing so is to prepare the surface of the silicon dioxide for the deposition of a layer of polycrystalline silicon to provide for a thinner and smoother polycrystalline silicon film. Therefore, it would have been obvious to combine Burns et al. with Applicant's admitted prior art to obtain the invention of claim 10.

With regard to claim 11, Burns et al. teach on pages 380 and 381, a memory array which further includes a plurality of memory cells arranged in rows and columns comprising at least one field effect transistor having a gate oxide, source, and drain formed on the substrate and a gate electrode for each transistor formed of the layer of polycrystalline silicon. The gate oxide for each transistor of the combination of references would be formed of the silicon dioxide having hydrogen atoms implanted therein.

With regard to claim 12, Official Notice is taken that one of ordinary skill in the art at the time of the invention would form the transistor of claim 10 or the memory array of claim 11 on a semiconductor wafer including a plurality of die. This is well known as in semiconductor processing multiple devices are formed on a single wafer then split into

individual die to allow for processing of a great number of die at one time to save of processing costs. Also, the gate electrode is a repeating series of gate electrodes for each transistor on each die formed from the layer of polycrystalline silicon.

Claim 14 is rejected under 35 U.S.C. 103(a) as being unpatentable over Murata et al. (U.S. Patent No. 5576229) in view of Applicant's admitted prior art.

Murata et al. teach a thin film transistor in figure 6E comprising a semiconductor substrate of glass, a layer of polycrystalline silicon 507 formed on a portion of the substrate, a insulating layer 503 formed on a portion of the polycrystalline silicon, a agte oxide, a source region 507a and drain region 507b formed in the polycrystalline silicon, and a gate electrode 504 formed on the insulating layer. Murata et al. do not teach the substrate having hydrogen ions implanted therein or the substrate being free of sputtered metal contaminants. Applicant's admitted prior art teaches implanting hydrogen ions into a silicon dioxide (glass) layer to provide a smooth topology polycrystalline silicon film thereon on page 1 lines 12-16. Applicant's admitted prior art as discussed above also teaches the silicon dioxide as being "free of sputtered metal contaminants."

Murata et al. and Applicant's admitted prior art are combinable because they are from the same field of endeavor. At the time of the invention it would have been obvious to a person of ordinary skill in the art to implant hydrogen ions into the glass substrate. The motivation for doing so is to prepare the surface of the glass substrate for the deposition of a layer of polycrystalline silicon to provide for a thinner and

smoother polycrystalline silicon film. Therefore, it would have been obvious to combine Murata et al. with Applicant's admitted prior art to obtain the invention of claim 14.

(10) Response to Argument

Regarding the rejection of claims 9-12 and 14 under 35 U.S.C. 112, second paragraph

The examiner has taken the position that the limitation "**free** of sputtered metal contaminants" is indefinite. The reasoning behind this rejection is that the term "free" is in fact a relative term since accepted physics principles dictate that no material will be completely free of metal contaminants. This relative term has not been defined or any objective standard alleged for determining what level of contamination is required to meet this limitation.

In response to this rejection, appellant has not pointed to any teachings in their disclosure or the prior art to enable one to determine what level of contamination meets the limitation. Appellant argues that terms in a claim are to be read in light of the specification but does not point to any part of their specification to show what level of contaminants is required. Appellant merely points out that their process eliminates one specific source of sputtered metal contaminants (the metal grid in the Kaufman ion source) such that their process **reduces the possibility** of metal contamination (see page 10 lines 6-11 of appellant's specification). See also page 6 lines 7 and 14 of appellant's brief which that that metal contamination is **reduced**, not eliminated. Thus, in light of page 10 of appellant's specification and page 6 of appellant's brief, it is clear that appellant's invention has not eliminated, or even alleged to eliminate, all sputtered

metal contamination. As such, reading the claimed terms in light of the specification, the term "free" must necessarily be a relative term since appellant's specification does not enable or describe a complete elimination of sputtered metal contaminants but merely a reduction of the possibility of contamination.

Appellant further argues that absolute precision and clarity are not required nor is there a requirement that numerical or percentage limitations be placed on claim terms. Appellant refers to *In re Marosi*, 218 USPQ (Fed. Cir. 1983) which decided that "essentially free of alkali metal" was definite where the specification provided general guidance, applicant was not required to put a numerical value on the limitation. Appellant argues that applying those basic principles to the present application, their claim is definite. This is not persuasive since the fact pattern in the *In re Marosi* decision is different from the fact pattern of the present case. In the *In re Marosi* decision, it was held that the limitation "essentially free" of a certain material was definite when applicant provided **general guideline and examples** that are sufficient to enable a person of ordinary skill in art to draw a line between unavoidable impurities and essential ingredients. In the *In re Marosi* case, the specification at issue had specifically defined the claim terminology in question, thus providing general guidance as to the meaning of the term, as well as providing at least one example. In the instant application, appellant has not provided general guidelines or any specific examples of what level of contamination is acceptable and thus has not sufficiently enabled a person of ordinary skill in the art to draw a line as to how many or few impurities are required by the term "free" of metal impurities.

Thus, in light of the fact that "free" is indeed a relative term and that applicant has not provided any general guideline or example, the claim in indefinite since one of ordinary skill in the art would not be able to determine what level of sputtered metal contamination is considered "free."

Even if the term "free" is interpreted to mean zero sputtered metal contaminants, appellant's disclosure has not enabled how one would form the device with zero contaminants. If "free" is interpreted to mean that there exists some maximum level of contaminants, appellant has failed to indicate what that level is.

Further, in considering a final device (not the method by which it was formed) one would not be able to determine if any metal contamination therein was a "sputtered" metal contaminant or if the level of metal contamination (introduced in any way) read on the claimed "free" of sputtered metal contaminants. There is no difference between the structure of a sputtered metal contaminant and the structure of any other metal contaminant. Thus, in a final device structure one would not be able to determine, by looking at a contaminant, if the contaminant was sputtered or introduced in another way. As such, the ordinary artisan would not be able to determine whether their device would infringe upon appellant's claims or not.

For these reasons, the claims are indefinite and the rejection under 35 U.S.C. 112, second paragraph is proper.

Regarding the rejection of claim 9 under 35 U.S.C. 102(a) as anticipated by "Applicant's admitted prior art"

Appellant has essentially argued that the admitted prior art device cannot be considered to anticipate claim 9 since the admitted prior art method employs a Kaufman ion source (for the implantation of the hydrogen ions) that causes contamination in the form of sputtered metal contaminants. Appellant argues that since the prior art device employs a method that has a specific source of sputtered metal contamination, one of ordinary skill in the art would not consider the limitation "free of sputtered metal contaminants" as encompassing a silicon dioxide layer which includes sputtered metal contaminants.

This is not persuasive for various reasons.

First, as clearly explained in the outstanding rejection, the term "free" of sputtered metal contaminants has been interpreted to mean "sufficiently free so as to operate." That is, to anticipate the claim the prior art much disclose a device that has a low enough level of sputtered metal contaminants to allow the device to still perform as intended. In this case, the admitted prior art teaches that currently in the art the Kaufman ion source is used to implant hydrogen ions into the layer of silicon dioxide for use in 64 Mb DRAM's. Thus, the admitted prior art teaches that the device formed using the Kaufman ion source is actually in use. If the devices are in fact in use, then the level of contamination must be low enough for the devices to operate as intended. Under this reasoning, the claim is so broad that the prior art device, even with it's sputtered metal contamination, reads on the claimed invention.

Further, it is noted that Appellant does not dispute that the admitted prior art discloses every element of the claim, except for the negatively recited limitation of "free of sputtered metal contaminants." There is nothing on the record to distinguish the excluded sputtered metal contaminants from those metal contaminants (preexisting or introduced by other means) not excluded by the claims. The claims on appeal, by virtue of using the term "comprising" in their preambles, do not preclude other metal contaminants (preexisting or introduced by other means) which are identical to or substantially identical to the sputtered metal contaminants in the device of the admitted prior art. Since the claims are drawn to a product, the process by which the contamination is introduced is immaterial since the final structure of a metal contaminant is the same regardless of how it got there. Thus, any number of metal contaminants are encompassed by the claimed device. Evidence that the claims do not preclude other metal contaminants can be found in appellant's arguments page 6 lines 11-13 that states "neither the specification nor the claims recite that the layer is free from all metal contaminants (the claims recite "free from sputtered metal contaminants")." Since any number of metal contaminants can be included in the claimed device, the claims do not distinguish over the admitted prior art.

Regarding the rejection of claim 10 under 35 U.S.C. 103(a) over Burns et al. in view of "Applicant's admitted prior art"

Appellant argues with regard to claim 10 that the combination of references does not teach the claimed layer being free of sputtered metal contaminants. Appellant's

arguments rely upon their previous arguments with regard to claim 9. Appellant's position is that the admitted prior art does not teach the layer of silicon dioxide being "free" of sputtered metal contaminants and as such the combination would not teach this limitation. Appellant also argues that since the method of the admitted prior art causes contamination, one would not look to that method as a way to implant hydrogen ions in the silicon dioxide layer of Burns et al.

First, as clearly explained above with regard to claim 9, the admitted prior art does teach the layer of silicon dioxide having hydrogen ions implanted therein and being free of sputtered metal contaminants. That is, the admitted prior art teach the claimed silicon dioxide layer. For either of two reasons, this is taught by the admitted prior art. First, since the claim term "free" is properly interpreted to mean a low enough number of contaminants so as to allow the device to operate and the device of the prior art is in use and thus operates, the admitted prior art teach this limitations. Or, second, since the claims do not preclude any number of metal impurities formed by other methods, and one cannot ascertain between structurally identical metal contaminants regardless of how they were formed, the claim reads on a device having any number of metal contaminants and thus the admitted prior art teaches the claimed limitation. Thus, the combination of Burns et al. with the admitted prior art does teach the claimed invention.

With regard to appellant's second argument, that since the method of the admitted prior art causes contamination, one would not look to that method as a way to implant hydrogen ions in the silicon dioxide layer of Burns et al., this argument is also

not persuasive. Proper motivation is provided in the admitted prior art as to why one of ordinary skill in the art would modify the device of Burns et al. to include the hydrogen implantation of the admitted prior art. As stated in the outstanding rejection, one would do so in order that a thinner and smoother polycrystalline silicon film can be formed thereon. As stated in the admitted prior art, this allows the formation of smaller components which in turn allows high device packing density. Appellant has not alleged that these reasons do not provide valid motivation.

Appellant alleges that, in light of the contamination problem, one would not be motivated to combine the references. This is not persuasive. Since the contamination from the Kaufman ion source is not great enough to prevent the devices (the admitted prior art's 64 Mb DRAM's) from operating and being used in industry, there is no specific teaching or evidence that the same contamination level would be undesirable in the device of Burns et al. The presumption that the contamination may, as a remote possibility, make the device of the combination less than ideal does not constitute an explicit teaching that the combination would be undesirable. Even if the device of the combination is less than ideal, one would still be motivated to combine the references in order to achieve greater device packing density. Thus, the motivation for combining the references is valid and the combination of the references is proper.

Regarding the rejection of claims 11 and 12 under 35 U.S.C. 103(a) over Burns et al. in view of "Applicant's admitted prior art"

Appellant's brief arguments with regard to these claims are substantially the same as the arguments with regard to claims 9 and 10. These arguments have been considered but are not persuasive for the same reasons that the arguments with regard to claims 9 and 10 are not persuasive. See the examiner's response above.

Regarding the rejection of claim 14 under 35 U.S.C. 103(a) over Murata et al. in view of "Applicant's admitted prior art"

Appellant's brief arguments with regard to this claim are substantially the same as the arguments with regard to claims 9 and 10-12. These arguments have been considered but are not persuasive for the same reasons that the arguments with regard to claims 9 and 10-12 are not persuasive. See the examiner's response above.

(11) Related Proceeding(s) Appendix

No decision rendered by a court or the Board is identified by the examiner in the Related Appeals and Interferences section of this examiner's answer.

For the above reasons, it is believed that the rejections should be sustained.

Respectfully submitted,

N. Drew Richards

Conferees:

Darren Schuberg

Ken Parker